

WHAT IS CLAIMED IS:

1. An interconnect assembly for a solid oxide fuel cell, comprising:
a separator plate having two opposed surfaces; and
at least one electron conducting compliant interconnect in electrical communication with the separator plate, the compliant interconnect comprising a compliant superstructure having a first portion defining a separator plate contact zone and a second portion defining an electrode contact zone, wherein the superstructure is porous to operating fuel cell gaseous materials.
2. The assembly of claim 1, wherein said compliant superstructure is compliant in at least three orthogonal axes.
3. The assembly of claim 1, wherein said compliant superstructure is compliant with respect to a load applied from any direction.
4. The assembly of claim 1, wherein said compliant superstructure comprises a first plurality of compliant substructures disposed in a first direction and a second plurality of compliant substructures disposed in a second direction different from said first direction so as to define a woven structure.
5. The assembly of claim 4 wherein at least one compliant substructure is pre-buckled.
6. The assembly of claim 4 wherein said compliant substructures comprise wires, and wherein said woven structure is a wire weave.
7. The assembly of claim 4 wherein said compliant substructures comprise pre-buckled wires, and wherein said woven structure is a wire weave.
8. The assembly of claim 4 wherein said compliant superstructure is dimpled, and wherein further a first plurality of dimples define said separator plate contact zone and a second plurality of dimples define said electrode contact zone.
9. The assembly of claim 8 wherein said first plurality of dimples extend substantially opposite to said second plurality of dimples.

10. The assembly of claim 1 wherein said interconnect is a cathode-side interconnect.
11. The assembly of claim 1 wherein said interconnect is an anode-side interconnect.
12. The assembly of claim 1, wherein said superstructure has a compliance of at least about $5 \times 10^{-6} \text{ mm}^2/\text{N}$.
13. The assembly of claim 1, wherein said superstructure has a compliance of at least about $5 \times 10^{-5} \text{ mm}^2/\text{N}$.
14. The assembly of claim 1, wherein said superstructure has a compliance of at least about $5 \times 10^{-4} \text{ mm}^2/\text{N}$.
15. The assembly of claim 1, wherein said compliant superstructure is shaped to include at least one substantially orthogonal channel.
16. The assembly of claim 1, wherein said compliant superstructure is shaped to include at least one substantially slanted channel.
17. The assembly of claim 1, wherein said compliant superstructure is shaped to include at least one substantially square channel.
18. The assembly of claim 1, wherein said compliant superstructure is shaped to include at least one substantially rectangular channel.
19. The assembly of claim 1, wherein said compliant superstructure is shaped to include at least one substantially sinusoidal channel.
20. The assembly of claim 1, wherein said compliant superstructure is shaped to include at least one substantially hour-glass shaped channel.

21. The assembly of claim 1, wherein said compliant superstructure is comprised of a stainless steel, stainless steel alloy, or stainless steel super-alloy.
22. The assembly of claim 1, wherein said compliant superstructure is comprised of a chromium-based alloy.
23. The assembly of claim 1, wherein said compliant superstructure is comprised of a noble metal-based alloy.
24. The assembly of claim 1, wherein said compliant superstructure is comprised of a composite of at least two materials.
25. An interconnect for a solid oxide fuel cell, comprising: a compliant superstructure having a first portion defining a separator plate contact zone and a second portion defining an electrode contact zone, wherein the superstructure is porous to operating fuel cell gaseous materials.
26. The apparatus of claim 25, wherein said compliant superstructure is compliant in at least three orthogonal axes.
27. The apparatus of claim 25, wherein said compliant superstructure is compliant with respect to a load applied from any direction.
28. The apparatus of claim 25, wherein said compliant superstructure comprises a first plurality of compliant substructures disposed in a first direction and a second plurality of compliant substructures disposed in a second direction different from said first direction so as to define a woven structure.
29. The apparatus of claim 28 wherein at least one compliant substructure is pre-buckled.
30. The apparatus of claim 28 wherein said compliant substructures comprise wires, and wherein said woven structure is a wire weave.

31. The apparatus of claim 28 wherein said compliant substructures comprise pre-buckled wires, and wherein said woven structure is a wire weave.
32. The apparatus of claim 28 wherein said compliant superstructure is dimpled, and wherein further a first plurality of dimples define said separator plate contact zone and a second plurality of dimples define said electrode contact zone.
33. The apparatus of claim 32 wherein said first plurality of dimples extend substantially opposite to said second plurality of dimples.
34. The apparatus of claim 25 wherein said interconnect is a cathode-side interconnect.
35. The apparatus of claim 25 wherein said interconnect is an anode-side interconnect.
36. The apparatus of claim 25, wherein said superstructure has a compliance of at least about $5 \times 10^{-6} \text{ mm}^2/\text{N}$.
37. The apparatus of claim 25, wherein said superstructure has a compliance of at least about $5 \times 10^{-5} \text{ mm}^2/\text{N}$.
38. The apparatus of claim 25, wherein said superstructure has a compliance of at least about $5 \times 10^{-4} \text{ mm}^2/\text{N}$.
39. The apparatus of claim 25, wherein said compliant superstructure is shaped to include at least one substantially orthogonal channel.
40. The apparatus of claim 25, wherein said compliant superstructure is shaped to include at least one substantially slanted channel.
41. The apparatus of claim 25, wherein said compliant superstructure is shaped to include at least one substantially square channel.

42. The apparatus of claim 25, wherein said compliant superstructure is shaped to include at least one substantially rectangular channel.

43. The apparatus of claim 25, wherein said compliant superstructure is shaped to include at least one substantially sinusoidal channel.

44. The apparatus of claim 25, wherein said compliant superstructure is shaped to include at least one substantially hour-glass shaped channel.

45. The apparatus of claim 25, wherein said compliant superstructure is comprised of a stainless steel, stainless steel alloy, or stainless steel super-alloy.

46. The apparatus of claim 25, wherein said compliant superstructure is comprised of a chromium-based alloy.

47. The apparatus of claim 25, wherein said compliant superstructure is comprised of a noble metal-based alloy.

48. The apparatus of claim 25, wherein said compliant superstructure is comprised of a composite of at least two materials.

49. A solid oxide fuel cell stack comprising:
at least three fuel cell assemblies in electrical contact, wherein at least one fuel cell assembly comprises an electrode, a separator plate, and a compliant interconnect positioned between the electrode and the separator plate, the compliant interconnect comprising a compliant superstructure having a first portion defining a separator plate contact zone and a second portion defining an electrode contact zone, wherein the superstructure is porous to operating fuel cell gaseous materials.

50. The apparatus of claim 49, wherein said compliant superstructure is compliant in at least three orthogonal axes.

51. The apparatus of claim 49, wherein said compliant superstructure is compliant with respect to a load applied from any direction.

52. The apparatus of claim 49, wherein said compliant superstructure comprises a first plurality of compliant substructures disposed in a first direction and a second plurality of compliant substructures disposed in a second direction different from said first direction so as to define a woven structure.